

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-162. (canceled)

163. (new) A method for two-dimensional and three-dimensional spatial manipulation of a virtual object, the method comprising:

providing a first tangible interface device to a user;

generating a first virtual interface component on a display screen, wherein the first virtual interface component corresponds to the first tangible interface device; and

receiving user input via the first tangible interface device to manipulate the first virtual interface component, wherein the first virtual interface component is capable of altering or generating one or more two-dimensional or three-dimensional virtual objects on the display screen, and wherein the first virtual interface component controls N degrees of freedom of the virtual objects.

164. (new) The method of claim 163, further comprising altering the function of the first virtual interface component by selecting a new function for the first virtual interface component, and generating a new virtual interface component to represent the new function on the display screen.

165. (new) The method of claim 164, wherein altering the function of the first virtual interface component further comprises mapping the first tangible interface device to the first virtual component.

166. (new) The method of claim 163, wherein altering the virtual object further comprises smoothing or texturizing a portion of the virtual object.

167. (new) The method of claim 163, wherein altering the virtual object further comprises bending the virtual object with the first virtual interface component.

168. (new) The method of claim 163, wherein altering the virtual object further comprises cutting the virtual object with the first virtual interface component.

169. (new) The method of claim 163, wherein altering the virtual object further comprises spray-painting the virtual object.

170. (new) The method of claim 163, wherein altering the virtual object further comprises erasing a portion of the virtual object.

171. (new) The method of claim 163, further comprising:

receiving user input via the first tangible interface device to contact the first virtual interface component with the virtual object;

receiving user input via the first tangible interface device to grab the virtual object with the first virtual interface component; and

receiving user input via the first tangible interface device to move the virtual object in a three-dimensional environment.

172. (new) The method of claim 163, further comprising:

receiving user input via the first tangible interface device to contact the first virtual interface component with the virtual object;

receiving user input via the first tangible interface device to grab the virtual object with the first virtual interface component; and

receiving user input via the first tangible interface device to rotate the virtual object in a three-dimensional environment.

173. (new) The method of claim 163, further comprising:

providing a second tangible interface device to the user;

generating a second virtual interface component on the display screen, wherein movements of the second tangible interface device cause corresponding movements to the second virtual component on the display screen; and

receiving user input via the second tangible interface device to manipulate the second virtual interface component, wherein the second virtual interface component is capable of interacting with the virtual objects or the first virtual interface component.

174. (new) The method of claim 173, wherein altering the function of the first virtual interface component comprises interacting the second virtual interface component with the first virtual interface component.

175. (new) The method of claim 173, wherein interacting the second virtual interface component further comprises altering the axis of rotation of the first virtual interface component by contacting the second virtual interface component with the first virtual interface component.

176. (new) The method of claim 173, further comprising:

receiving user input via the first and second tangible interface devices to contact the first and second virtual interface components with each end of the virtual object; and

receiving user input via the first and second tangible interface devices to rotate the virtual object in a three-dimensional space with the first and second virtual interface components.

177. (new) A method for two-dimensional and three-dimensional spatial manipulation of a virtual object, the method comprising:

providing a first and a second tangible interface device to a user;

generating a first virtual interface component and a second virtual interface component on a display screen, wherein the first virtual interface component corresponds to the first tangible interface device and the second virtual interface component corresponds to the second tangible interface device; and

receiving user input via the first and second tangible interface devices to manipulate the first and second virtual interface components, wherein the first and second virtual components are capable of altering or generating one or more two-dimensional or three-dimensional virtual objects on the display screen, and wherein the first and second virtual components control N degrees of freedom of the virtual objects.

178. (new) The method of claim 177, further comprising altering the function of the first virtual interface component by selecting a new function for the first virtual interface component, and generating a new virtual interface component to represent the new function on the display screen.

179. (new) The method of claim 177, wherein altering the virtual object further comprises smoothing or texturizing a portion of the virtual object.

180. (new) The method of claim 177, wherein altering the virtual object further comprises bending the virtual object with the first virtual interface component.

181. (new) The method of claim 177, wherein altering the virtual object further comprises cutting the virtual object with the first virtual interface component.

182. (new) The method of claim 177, wherein altering the virtual object further comprises spray-painting the virtual object.

183. (new) The method of claim 177, wherein altering the virtual object further comprises erasing a portion of the virtual object.

184. (new) A method for drawing two-dimensional and three-dimensional virtual objects, the method comprising:

providing a first and a second tangible interface device to a user;

generating a first virtual interface component and a second virtual interface component on a display screen, wherein the first virtual interface component corresponds to the first tangible interface device and the second virtual interface component corresponds to the second tangible interface device;

receiving user input via the first tangible interface device to create a virtual object;

receiving user input via the second tangible interface device to grasp a portion of the virtual object;

receiving user input via the second tangible interface device to bend the virtual object;

receiving user input via the second tangible interface device, wherein the second tangible interface device is moved away from the virtual object;

determining whether the movement of the second tangible interface device is a closed curve; and

generating a virtual three-dimensional volume when the movement of the second tangible interface device creates a closed curve.

185. (new) The method of claim 184, wherein the first tangible interface device has a pointing function.

186. (new) The method of claim 184, wherein the second tangible interface device has a grabbing function.

187. (new) A method for constructing a virtual representation of a molecule, the method comprising:

providing one or more tangible interface devices having one or more functions, wherein the functions include drawing one or more molecule components, drawing one or more bonds, moving the molecule in a three-dimensional environment, or rotating the molecule;

generating virtual interface components corresponding to the tangible interface devices on a display screen;

receiving user input via a first tangible interface device to draw one or more molecule components with a first virtual interface component;

receiving user input via a second tangible interface device to draw one or more bonds between the molecule components with a second virtual interface component;

receiving user input altering the function of the first tangible interface device to break one or more bonds; and

receiving user input via a third tangible interface to move, if necessary, the virtual molecule in the three-dimensional environment.

188. (new) A method for two-dimensional and three-dimensional spatial manipulation of a virtual object, the method comprising:

providing a first tangible interface device to a user;

mapping the first tangible interface device to a first virtual interface device;

generating a first virtual interface component on a display screen, wherein movements of the first tangible interface device cause corresponding movements to the first virtual interface component;

receiving user input via the first tangible interface device to manipulate the first virtual interface component, wherein the first virtual interface component is capable of altering or generating one or more two-dimensional or three-dimensional virtual objects on the display

screen, and wherein the first virtual interface component controls N degrees of freedom of the virtual objects; and

altering the function of the first virtual interface component when user input is received via the first tangible interface device.

189. (new) The method of claim 188, wherein altering the function of the first virtual interface component further comprises selecting a new function for the first virtual interface component, and generating a new virtual interface component to represent the new function on the display screen.

190. (new) The method of claim 188, wherein altering the virtual object further comprises smoothing or texturizing a portion of the virtual object.

191. (new) The method of claim 188, wherein altering the virtual object further comprises bending the virtual object with the first virtual interface component.

192. (new) The method of claim 188, wherein altering the virtual object further comprises cutting the virtual object with the first virtual interface component.

193. (new) The method of claim 188, wherein altering the virtual object further comprises spray-painting the virtual object.

194. (new) The method of claim 188, wherein altering the virtual object further comprises erasing a portion of the virtual object.

195. (new) The method of claim 188, further comprising:
providing a second tangible interface device to the user;
mapping the second tangible interface device to a second virtual interface device;
generating the second virtual interface component on the display screen, wherein movements of the second tangible interface device cause corresponding movements to the second virtual component on the display screen; and

receiving user input via the second tangible interface device to manipulate the second virtual interface component, wherein the second virtual interface component is capable of interacting with the virtual objects or the first virtual interface component.

196. (new) The method of claim 195, wherein altering the function of the first virtual interface component comprises interacting the second virtual interface component with the first virtual interface component.

197. (new) The method of claim 195, wherein interacting the second virtual interface component further comprises altering the axis of rotation of the first virtual interface component by contacting the second virtual interface component with the first virtual interface component.

198. (new) The method of claim 195, further comprising:

receiving user input via the first and second tangible interface devices to contact the first and second virtual interface components with each end of the virtual object; and

receiving user input via the first and second tangible interface devices to rotate the virtual object in a three-dimensional space with the first and second virtual interface components.